WHAT IS CLAIMED IS:

1. A chimeric molecule comprising a first domain comprising a fluorescent, bioluminescent or chemiluminescent polypeptide, or a heterologous kinase, and a second domain comprising a member selected from the group consisting of an RGD motif-comprising polypeptide; a selectin-binding polypeptide; a matrix metalloproteinase (MMP)-binding polypeptide, and a chondroitin sulfate proteoglycan-binding polypeptide.

2. The chimeric molecule of claim 1, wherein the chemiluminescent polypeptide comprises luciferase.

3. The chimeric molecule of claim 1, wherein the fluorescent, bioluminescent or chemiluminescent compound comprises an aequorin, an obelin, a mnemiopsin or a berovin.

4. The chimeric molecule of claim 1, wherein the heterologous kinase comprises a herpes simplex virus-1 thymidine kinase (HSV-1 TK).

5. The chimeric molecule of claim 1, wherein the RGD motif-comprising polypeptide specifically binds to a cell-specific polypeptide, a tissue-specific polypeptide or an organ-specific polypeptide.

6. The chimeric molecule of claim 5, wherein the cell-specific polypeptide is a tumor-specific polypeptide.

7. The chimeric molecule of claim 5, wherein the cell-specific polypeptide is expressed on tumor neovasculature.

8. The chimeric molecule of claim 1, wherein the RGD motif-comprising polypeptide comprises an integrin polypeptide.

9. The chimeric molecule of claim 1, wherein the RGD motif-comprising polypeptide comprises an CDCRGDCFC (SEQ ID NO:1) amino acid sequence.

10. The chimeric molecule of claim 1, wherein the selectin is an E-selectin.

11. The chimeric molecule of claim 1, wherein the selectin binding polypeptide comprises an IELLQAR (SEQ ID NO:2) amino acid sequence.

12. The chimeric molecule of claim 1, wherein the matrix metalloproteinase is a gelatinase A or a gelatinase B.

13. The chimeric molecule of claim 1, wherein the matrix metalloproteinase binding polypeptide comprises an CTTHWGFTLC (SEQ ID NO:3) amino acid sequence.

14. The chimeric molecule of claim 1, wherein the chondroitin sulfate proteoglycan comprises a high molecular weight human melanoma-associated antigen.

15. The chimeric molecule of claim 1, wherein the chondroitin sulfate proteoglycan binding polypeptide comprises a TAASGVRSMH (SEQ ID NO:4) or LTLRWVGLMS (SEQ ID NO:5) sequence.

16. The chimeric molecule of claim 1, wherein the chimeric molecule is capable of specifically binding to a lumen-expressed vascular endothelial cell protein.

17. A gold nanoparticle comprising the chimeric molecule of claim 1.

18. A pharmaceutical formulation comprising a chimeric molecule and a pharmaceutically acceptable excipient,

wherein the chimeric molecule comprises a first domain comprising a fluorescent, bioluminescent or chemiluminescent polypeptide, or a heterologous kinase, and a second domain comprising a member selected from the group consisting of an RGD motif-comprising polypeptide; a selectin-binding polypeptide; a matrix metalloproteinase (MMP)-binding polypeptide, and a chondroitin sulfate proteoglycan-binding polypeptide,

wherein the formulation is suitable for administration as an imaging enhancing agent and the chimeric molecule is present is an amount sufficient to enhance a computer assisted tomography (CAT) image, a magnetic resonance spectroscopy (MRS) image, a magnetic resonance imaging (MRI) image, a positron emission tomography (PET) image, a single-photon emission computed tomography (SPECT) image or a bioluminescence image (BLI).

19. A pharmaceutical formulation comprising

a composition comprising a first domain comprising an imaging enhancing agent and a second domain comprising a polypeptide that binds to a cell, a tissue or an organ in a cell-, tissue-, or organ-specific manner, and a pharmaceutically acceptable excipient,

wherein the formulation is suitable for administration as an imaging enhancing agent and the composition is not an antibody and is present is an amount sufficient to enhance a computer assisted tomography (CAT) image, a magnetic resonance spectroscopy (MRS) image, a magnetic resonance imaging (MRI) image, a positron emission tomography (PET) image, a single-photon emission computed tomography (SPECT) image, a bioluminescence image (BLI) or equivalent, when the pharmaceutical formulation is administered to an individual.

20. The pharmaceutical formulation of claim 19, herein the imaging enhancing agent comprises a fluorescent, a bioluminescent or a chemiluminescent polypeptide and the composition is a chimeric recombinant protein.

21. The pharmaceutical formulation of claim 20, wherein the bioluminescent or chemiluminescent compound comprises a luciferase.

22. The pharmaceutical formulation of claim 20, wherein the bioluminescent or chemiluminescent compound comprises an aequorin, an obelin, a mnemiopsin or a berovin.

23. The pharmaceutical formulation of claim 19, wherein the bioluminescent or chemiluminescent compound comprises a phenanthridinium ester.

24. The pharmaceutical formulation of claim 19, wherein the image enhancing agent comprises a kinase.

25. The pharmaceutical formulation of claim 24, wherein the kinase comprises a herpes simplex virus-1 thymidine kinase (HSV-1 TK).

26. The pharmaceutical formulation of claim 19, wherein the imaging-enhancing agent comprises a radioactive isotope.

27. The pharmaceutical formulation of claim 26, wherein the radioactive isotope comprises ^{131}I, ^{125}I, ^{123}I, ^{18}F, ^{11}C, ^{75}Br, ^{76}Br, ^{19}F, ^{13}C, ^{14}C or ^{3}H.

28. The pharmaceutical formulation of claim 19, wherein the imaging-enhancing agent comprises a paramagnetic compound.

29. The pharmaceutical formulation of claim 28, wherein the paramagnetic compound comprises a polypeptide chelated to a metal.

30. The pharmaceutical formulation of claim 28, wherein the paramagnetic compound comprises a metalloporphyrin.

31. The pharmaceutical formulation of claim 28, wherein the paramagnetic compound comprises a monocrystalline nanoparticle.

32. The pharmaceutical formulation of claim 31, wherein the monocrystalline nanoparticle comprises an iron oxide or a lanthanide.

33. The pharmaceutical formulation of claim 28, wherein the paramagnetic compound comprises a metal ion comprising a lanthanide of atomic numbers 58-70, a transition metal of atomic numbers 21 to 29, 42 or 44, a Gd(III), a Mn(II), or an element comprising an Fe element.

34. The pharmaceutical formulation of claim 28, wherein the paramagnetic compound is a neodymium iron oxide ($NdFeO_3$) or a dysprosium iron oxide ($DyFeO_3$).

35. The pharmaceutical formulation of claim 19, wherein the imaging-enhancing agent comprises a synthetic compound.

36. The pharmaceutical formulation of claim 19, wherein the composition comprises a peptidomimetic or a peptide.

37. The pharmaceutical formulation of claim 19, wherein the compound of the second domain comprises a member selected from the group consisting of an RGD motif-comprising polypeptide; a selectin-binding polypeptide; a matrix metalloproteinase (MMP)-binding polypeptide, and a chondroitin sulfate proteoglycan-binding polypeptide.

38. The pharmaceutical formulation of claim 19, further comprising a cytotoxic agent.

39. The pharmaceutical composition of claim 38, wherein the cytotoxic agent comprises an antitumor agent.

40. The pharmaceutical composition of claim 19, further comprising a substrate for the bioluminescent or chemiluminescent polypeptide or the heterologous kinase.

41. The pharmaceutical composition of claim 40, wherein the chemiluminescent polypeptide is luciferase and the substrate is luciferin.

42. The pharmaceutical composition of claim 40, wherein the heterologous kinase is 8-[18F] fluoroganciclovir (FGCV) and the substrate is a herpes simplex virus-1 thymidine kinase (HSV-1 TK).

43. The pharmaceutical composition of claim 19, further comprising a liposome.

44. The pharmaceutical formulation of claim 19, wherein the pharmaceutically acceptable excipient is a buffered saline, or equivalent.

45. A nucleic acid encoding a chimeric polypeptide as set forth in claim 1.

46. A nucleic acid comprising an open reading frame operably linked to a promoter, wherein the open reading frame encodes a chimeric polypeptide as set forth in claim 1.

47. An expression vector comprising a nucleic acid encoding a chimeric polypeptide as set forth in claim 1.

48. A cell comprising a nucleic acid encoding a chimeric polypeptide as set forth in claim 1.

49. The cell of claim 48, wherein the cell is a bacterial, a yeast, an insect, or a mammalian cell.

50. A recombinant chimeric polypeptide produced by a cell comprising a nucleic acid encoding a chimeric polypeptide as set forth in claim 1.

51. A method for *in situ* or *in vivo* imaging of a cell, a tissue, an organ or a full body comprising administration of a pharmaceutical formulation in an amount sufficient to enhance the image, wherein the pharmaceutical formulation comprises a composition as set forth in claim 18,

wherein the image is generated by computer assisted tomography (CAT), magnetic resonance spectroscopy (MRS), magnetic resonance imaging (MRI), positron emission tomography (PET), single-photon emission computed tomography (SPECT), bioluminescence imaging (BLI) or equivalent.

52. A method for *in situ* or *in vivo* imaging of a cell, a tissue, an organ or a full body comprising the following steps:

(a) providing a pharmaceutical formulation as set forth in claim 18;

(b) providing an imaging device

wherein the imaging device is a computer assisted tomography (CAT) device, a magnetic resonance spectroscopy (MRS) device, a magnetic resonance imaging (MRI) device, a positron emission tomography (PET) device, a single-photon emission computed tomography (SPECT) device, a bioluminescence imaging (BLI) device or equivalent;

(c) administering the pharmaceutical formulation in an amount sufficient to generate the cell, tissue or body image; and,

(d) imaging the distribution of the pharmaceutical formulation of step (a) with the imaging device, thereby imaging the cell, tissue or body.

53. The method of claim 52, wherein the pharmaceutical formulation is administered to a human.

54. The method of claim 52, wherein the tissue is a tumor tissue.

55. The method of claim 52, wherein the pharmaceutical formulation is administered intravenously.

56. The method of claim 52, wherein image is taken between about 2 minutes and about 24 hours after administering the pharmaceutical formulation.

57. The method of claim 52, further comprising providing a substrate for the bioluminescent or chemiluminescent polypeptide, or the heterologous kinase, and administering the substrate with or after administration of the bioluminescent or chemiluminescent polypeptide or the heterologous kinase.

58. The method of claim 57, wherein the chemiluminescent polypeptide is luciferase and the substrate is luciferin.

59. A method for *in vivo* imaging a tumor neovasculature in an individual comprising the following steps:

(a) providing a pharmaceutical formulation as set forth in claim 18;

(b) providing an imaging device

wherein the imaging device is computer assisted tomography (CAT), magnetic resonance spectroscopy (MRS), magnetic resonance imaging (MRI), positron emission tomography (PET), single-photon emission computed tomography (SPECT), bioluminescence image (BLI) or equivalent;

(c) administering the pharmaceutical formulation in an amount sufficient to image the tumor neovasculature; and,

(d) imaging the distribution of the pharmaceutical formulation of step (a) with the imaging device, thereby imaging the tumor neovasculature.

60. A method for *in vivo* screening for an anti-tumor agent by imaging a tumor neovasculature in an individual comprising the following steps:

(a) providing a composition comprising a chimeric polypeptide as set forth in claim 1 or a pharmaceutical formulation as set forth in claim 18, and a test compound;

(b) providing an imaging device

wherein the imaging device is computer assisted tomography (CAT), magnetic resonance spectroscopy (MRS), magnetic resonance imaging (MRI), positron

emission tomography (PET), single-photon emission computed tomography (SPECT), bioluminescence image (BLI) or equivalent;

(c) administering the composition of step (a) in an amount sufficient to image the tumor neovasculature and imaging the distribution of the composition with the imaging device, thereby imaging the tumor neovasculature;

(d) administering the test compound; and

(e) imaging the distribution of the composition with the imaging device, thereby imaging the tumor neovasculature, wherein a decrease in the amount of tumor neovasculature indicates that the compound is an anti-tumor or an anti-angiogenic agent.